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APPLICANT : NIPPON HOSO KYOKAI <NHK>;

INVENTOR : INOUE SEIKI;

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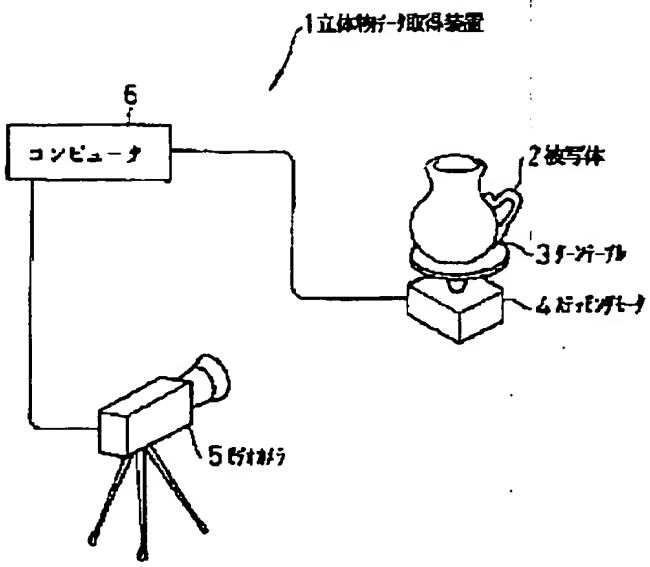
TITLE : DATA ACQUISITION DEVICE FOR THREE-DIMENSIONAL OBJECT



ABSTRACT : PURPOSE: To reduce the cost of a device for obtaining three-dimensional data from an object, by using a spacial light source so as to prevent detrimental affections to an object to be picked up, while simultaneously obtaining three dimensional data and surface texture data from the object, and by simplifying the structure of the device.

CONSTITUTION: The motion of a feature point on an object 2 to be picked up is detected from an image (two-dimensional image) per unit turn angle picked up from the object 2 to be picked up by a video camera 5 while the turn angle of a stepping motor 4 is controlled by a computer 6, and from a turn angle of the stepping motor 4, so as to seek the rotating axis of the object to be picked up. Further, three-dimensional data of the object 3 to be picked up are obtained on the basis of the rotating axis, and further, surface texture data are obtained from thus obtained threedimensional data and a two-dimensional image per unit turn angle.

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This inventions are only the two-dimensional picture photoed under general photography conditions, and the angle information at the time of photography, and relate to the exact 3-dimensional configuration information on the solid object used as material information, such as compression of a dynamic image, objective recognition, and the CG creation, exact surface texture (Surface Texture) information, and the obtained solid object data acquisition equipment.
[0002] A [outline of invention] this invention is a thing about the equipment which acquires the 3-dimensional configuration information on a solid object, and the surface texture information corresponding to it from the photography image which is a two-dimensional picture, without using special lighting, a special sensor, etc. of **** of measurement assistance. While extracting a photographic subject's focus from the two-dimensional image photoed and obtained with a video camera etc., carrying the target photographic subject on a rotation base, and rotating this Based on the movement information on each of these focus, by carrying out iterative operation of the relative inclination of the axis of rotation to the lens optical axis of a video camera The axis-of-rotation information that the precision which considered correspondence with the 3-dimensional space where a photographic subject exists, and the camera image pck-up side which is two-dimensional as central projection, and was acquired by iterative operation is high, Using known angle-of-rotation information, compared with the conventional technique of needing the light sources, exact camera positional information, etc., such as laser slit light, it is easy composition and the 3-dimensional configuration information on a solid object and the surface texture information corresponding to it are acquired.
[0003]
[Description of the Prior Art] There is the passive measurement technique using the special light sources, such as laser slit light, the special active measurement technique to be used, such as sensor etc., and photography images, such as a video camera, as the 3-dimensional configuration information on the solid object used as material information, such as compression of a dynamic image, objective recognition, and the CG creation, surface texture information, and technique to acquire conventionally.
[0004] As a former example, there is slit light projection, and by this slit light projection, as it states below, the 3-dimensional configuration information on a solid object is acquired.
[0005] First, as shown in drawing 7 , while establishing a base 103 in the position which only predetermined distance left from the base 102 on which the photographic subject 101 was put and arranging a laser light source 104 on this base 103, the cylindrical lens 105 which changes into the slit light (laser slit light) S the laser beam by which outgoing radiation is carried out from this laser light source 104 is arranged, and a camera 106 is arranged in the position which only predetermined distance left from the base 102 on which the aforementioned photographic subject 101 is put further.
[0006] And where a photographic subject 101 is carried on a base 102, while carrying out outgoing radiation of the laser beam from a laser light source 104, changing this laser beam into the slit light (laser slit light) S with a cylindrical lens 105 and irradiating the aforementioned photographic subject 101, the

aforementioned photographic subject 101 is photoed with a camera 106, and the slit picture of the photographic subject 101 corresponding to the laser slit light S is made to be caught on the image pck-up side 107 of this camera 106.
[0007] The 3-dimensional space coordinates of the point P on the flat surface which the laser slit light S makes by this among the 3-dimensional space coordinates which show the shape of a photographic subject's 101 surface type This point P It is projected on certain one point P' on the image pck-up side 107 through the straight line L passing through the lens center O of a camera 106, and the visible outline (slit picture) of the cross section cut off at the flat surface which the aforementioned laser slit light S makes among the shape of the aforementioned photographic subject's 101 surface type on the image pck-up side 107 is projected.
[0008] Moving horizontally the direction of laser outgoing radiation of a laser light source 104 little by little, photography which mentioned above is performed and the visible outline of the cross section cut off at each flat surface which each aforementioned laser slit light S makes among the shape of a photographic subject's 101 surface type on each image pck-up side 107 is made to project hereafter.
[0009] And each visible outline on each slit picture obtained when the photography processing mentioned above was completed is supplied to the processor which performs compression of a dynamic image, objective recognition, CG creation, etc. as the aforementioned photographic subject's 101 3-dimensional information, and each aforementioned visible outline is made to process about the photographic subject 101 whole.
[0010] Moreover, as a latter example, there is the 3-dimensional baud DINGU method, and by this 3-dimensional baud DINGU method, as it states below, the 3-dimensional configuration information on a solid object is acquired.
[0011] First, as a photographic subject is photoed from two or more views with a camera and it is shown in drawing 8 , the point (two-dimensional focus) which serves as the aforementioned photographic subject's feature from each picture acquired by this is extracted, and it asks for the visual axis passing through these 2-dimensional each focus and lens centers of a camera.
[0012] Subsequently, by dividing into a 3-dimensional pixel (this being hereafter called the voxel) the space where a photographic subject exists, adding the constant value defined beforehand to each voxel along which each visual axis passes, and calculating the cluster value for every voxel The voxel which each visual axis intersects mostly is extracted as a photographic subject's 3-dimensional focus. these 3-dimensional each focus as the aforementioned photographic subject's 3-dimensional information The processor which performs compression of a dynamic image, objective recognition, CG creation, etc. is supplied, and the aforementioned 3-dimensional each focus is made to process.
[0013]
[Problem(s) to be Solved by the Invention] However, there was a problem which is described below in the slit light projection and the 3-dimensional baud DINGU method which were mentioned above.
[0014] First, in the slit light projection shown in drawing 7 , in order to raise measurement precision Since a laser light source 104 is used and width of face of the laser slit light S is narrowed as the light source When a photographic subject 101 is the work of art which is made of paper etc., while it dries the front face of a work of art with the heat of the laser slit light S or there is a possibility of making it discoloring Since only a photographic subject's 101 3-dimensional configuration information could be acquired, a photographic subject's front face was photoed separately and there was a problem that a photographic subject's 101 surface texture information had to be acquired.
[0015] moreover, by the 3-dimensional baud DINGU method shown in drawing 8 When two or more 3-dimensional focus is extracted simultaneously, the processing to the 3-dimensional each focus interferes each other, and the false 3-dimensional focus occurs. moreover, by the quantization error of a picture etc. While being unable to extract the focus which became below the threshold with the added cluster value as the 3-dimensional focus, there was a problem that the precision of a configuration will be decided by the set-up voxel space quantization degree.
[0016] Furthermore, theoretically, although the information on an exact camera position is needed, it has

not been the technique which it was difficult to extract the exact 3-dimensional focus, and it still established technically at present from it being very difficult to ask for the center position of a camera lens correctly.

[0017] While a photographic subject's exact 3-dimensional configuration information and surface texture information are acquirable simultaneously, preventing the bad influence to the photographic subject by this invention using the special light source in view of the above-mentioned situation, an equipment configuration is simplified very much and it aims at offering the solid object data acquisition equipment which can reduce the manufacturing cost of equipment sharply.

[0018]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the solid object data acquisition equipment by this invention The rotation drive made to rotate a photographic subject in predetermined angle in a claim 1, The motion picture camera style by which the rotation drive was carried out with this rotation drive and which photos the aforementioned photographic subject and outputs a two-dimensional picture for every angle of rotation, Based on the two-dimensional picture for every angle of rotation and angle of rotation of the aforementioned rotation drive which were obtained by this motion picture camera style, the movement of the focus in the aforementioned photographic subject's front face is detected. The 3-dimensional configuration information acquisition processing section which searches the aforementioned photographic subject's axis of rotation, and creates the aforementioned photographic subject's 3-dimensional configuration information based on this axis of rotation and the aforementioned focus, It is characterized by having the surface texture information acquisition processing section which creates surface texture information based on the 3-dimensional configuration information of the aforementioned photographic subject obtained by this 3-dimensional configuration information acquisition processing section, and the two-dimensional picture for every angle of rotation obtained by the aforementioned motion picture camera style.

[0019] Moreover, in a claim 2, in solid object data acquisition equipment according to claim 1, while the aforementioned 3-dimensional configuration information acquisition processing section extracts the focus from the two-dimensional picture for every angle of rotation After detecting the movement of each of these focus and detecting the axis of rotation corresponding to each focus, Arrange each of these axes of rotation in the shape of a straight line, determine the position on the 3-dimensional space of each aforementioned focus, and a photographic subject's 3-dimensional configuration information is created. Moreover, the aforementioned surface texture information acquisition processing section is based on the aforementioned photographic subject's 3-dimensional configuration information. To the aforementioned motion picture camera style, the surface field surrounded by each focus detects angle of rotation which carries out a right pair, and is characterized by creating surface texture information based on the pattern of the two-dimensional picture of this angle of rotation.

[0020]

[Function] In the above-mentioned composition with the solid object data acquisition equipment of a claim 1 While photoing the aforementioned photographic subject and generating a two-dimensional picture for every angle of rotation by the motion picture camera style, rotating a photographic subject in predetermined angle with a rotation drive The 3-dimensional configuration information acquisition processing section detects the movement of the focus in the aforementioned photographic subject's front face based on the two-dimensional picture for every aforementioned angle of rotation, and angle of rotation of the aforementioned rotation drive. After searching the aforementioned photographic subject's axis of rotation, it is based on this axis of rotation and the aforementioned focus. Create the aforementioned photographic subject's 3-dimensional configuration information, and it is based on the 3-dimensional configuration information of the aforementioned photographic subject further obtained by the surface texture information acquisition processing section in the aforementioned 3-dimensional configuration information acquisition processing section, and the two-dimensional picture for every angle of rotation obtained at aforementioned motion picture camera guard. While acquiring simultaneously a photographic subject's exact 3-dimensional configuration information and surface texture information,

preventing the bad influence to the photographic subject by using the special light source by creating surface texture information An equipment configuration is simplified very much and the manufacturing cost of equipment is reduced sharply.

[0021] In a claim 2, it sets to solid object data acquisition equipment according to claim 1. moreover, in the aforementioned 3-dimensional configuration information acquisition processing section While extracting the focus from the two-dimensional picture for every angle of rotation, the movement of each of these focus is detected. After detecting the axis of rotation corresponding to each focus, each of these axes of rotation are arranged in the shape of a straight line, the position on the 3-dimensional space of each aforementioned focus is determined, and a photographic subject's 3-dimensional configuration information is created. in moreover, the aforementioned surface texture information acquisition processing section When the surface field surrounded by each focus detects angle of rotation which carries out a right pair to the aforementioned motion picture camera style and creates surface texture information based on the pattern of the two-dimensional picture of this angle of rotation based on the aforementioned photographic subject's 3-dimensional configuration information While acquiring simultaneously a photographic subject's exact 3-dimensional configuration information and surface texture information, preventing the bad influence to the photographic subject by using the special light source like a claim 1, an equipment configuration is simplified very much and the manufacturing cost of equipment is reduced sharply.

[0022]

[Example] Drawing 1 is the block diagram showing one example of the solid object data acquisition equipment by this invention.

[0023] The turntable 3 on which, as for the solid object data acquisition equipment 1 shown in this drawing, a photographic subject 2 is put, This turntable 3 Every [a fixed angle] and the stepping motor 4 to rotate, It is arranged in the position which only predetermined distance separated from the aforementioned photographic subject 2, and the video camera 5 which photos the aforementioned photographic subject 2, and the image obtained with the aforementioned video camera 5 while controlling operation of the aforementioned stepping motor 4 are incorporated. It has the computer 6 which searches for simultaneously the aforementioned photographic subject's 2 exact 3-dimensional configuration information and surface texture information.

[0024] And, controlling angle of rotation of the aforementioned stepping motor 4 by the computer 6 The picture for every angle of rotation which photoed the aforementioned photographic subject 2 and was obtained with the video camera 5 (two-dimensional picture), While detecting the movement of the focus in the aforementioned photographic subject's 2 front face based on angle of rotation of the aforementioned stepping motor 4, searching the aforementioned photographic subject's 2 axis of rotation, carrying out based on the information on this axis of rotation and creating the aforementioned photographic subject's 2 3-dimensional configuration information Based on this 3-dimensional configuration information and the two-dimensional picture for every aforementioned angle of rotation, surface texture information is created and these 3-dimensional configuration information and surface texture information are supplied to the processor which performs compression of a dynamic image, objective recognition, CG creation, etc.

[0025] Next, processing of the computer 6 shown in drawing 1 is explained in detail, referring to the block diagram shown in drawing 2 .

[0026] As shown in drawing 2 , a computer 6 First, photography and the angle control section 10, The focus detecting element 11, the movement detecting element 12, the axis-of-rotation reference section 13, and the re-projection section 14, The function has separated in texture geometrical conversion and the average section 15, and photography and the angle control section 10 perform picture acquisition processing for every angle of rotation. Moreover, the focus detecting element 11, The movement detecting element 12, the axis-of-rotation reference section 13, and the re-projection section 14 perform acquisition processing of 3-dimensional configuration information, and texture geometrical conversion and the average section 15 perform acquisition processing of surface texture information further.

[0027] Picture acquisition processing [for <<each angle of rotation of every]>>
The <photography and angle control-section 10> photography and the angle control sections 10 are angle-of-rotation units, such as 1 step unit or a half step unit. While rotating the turntable 3 on which the rotation drive of the stepping motor 4 was carried out, and the photographic subject 2 was put It holds as a pixel which is made to photo a photographic subject 2 with a video camera 5, incorporates a photographic subject's 2 picture (two-dimensional picture) for every angle of rotation, makes lengthwise [of a photographic subject 2] a line for this as shown in drawing 3 , and makes a train the aforementioned photographic subject's 2 longitudinal direction and by which two-dimensional array was carried out. In addition, the data (pixel data) of the pixel arranged on two-dimensional have a big numeric value, so that they are bright.
[0028] And the two-dimensional picture for every angle of rotation which is made to act as the one revolution of the aforementioned photographic subjects 2, and is obtained is supplied to the focus detecting element 11, the movement detecting element 12, and texture geometrical conversion and the average section 15.
[0029] Acquisition processing [of 3 <<-dimensional configuration information]>>
While the <focus detecting-element 11> focus detecting element 11 incorporates the two-dimensional picture for every angle of rotation outputted from the aforementioned photography and the angle control section 10 After dividing 8 pixels of each pixel of this two-dimensional picture at a time in a line writing direction and the direction of a train and dividing into two or more fields, Square total of the profile intensity which asks for the profile intensity of each image data, and is contained to each of these fields The central point of all the fields that have become more than the threshold set up beforehand is extracted as the focus of this two-dimensional picture, it moves as the original focus and each of these focus is supplied to a detecting element 12, the axis-of-rotation reference section 12, and the re-projection section 14.
[0030] While the <movement detecting-element 12> movement detecting element 12 incorporates the original focus for every angle of rotation outputted from the aforementioned focus detecting element 11, and the two-dimensional picture for every angle of rotation outputted from the aforementioned photography and the angle control section 10 Based on the original focus on one two-dimensional picture, the portion of the content closely resembled most within other two-dimensional pictures which should ask for correspondence is extracted. When block matching of the technique of making this portion the focus coordinate in a 2-dimensional each picture is performed and each focus of a photographic subject 2 rotates, it asks for how it moved as a coordinate value on the image pck-up side of a video camera 5.
[0031] In addition, the field which is in other two-dimensional pictures which should ask for correspondence in fact based on the original focus on one two-dimensional picture is chosen, processing which searches for the difference of the pixel brightness of the same coordinates in this field is performed about all the pixels in a field, and square total (evaluation value) of each pixel obtained by this makes the portion used as the minimum the focus corresponding to the aforementioned field focus.
[0032] And block matching with the two-dimensional picture of a further different angle is performed to such a coordinate of the corresponding original focus, the original focus which correspond among each field focus of a 2-dimensional each picture is summarized, and the axis-of-rotation reference section 13, and texture geometrical conversion and the average section 15 are supplied by making the coordinate (coordinate on a 2-dimensional each picture) of each of these field focus into a focus coordinate group.
[0033] however, since the original focus which corresponds depending on a two-dimensional picture may not exist, when it is below a threshold with an evaluation value Only when processing judged that the corresponding original focus does not exist is performed and the three or more original focus corresponds on the two-dimensional picture photoed by the angle of rotation, the axis-of-rotation reference section 13, and texture geometrical conversion and the average section 15 are supplied by making these original focus into a focus coordinate group.
[0034] While the <axis-of-rotation reference section 13> axis-of-rotation reference section 13

incorporates each focus coordinate group outputted from the aforementioned movement detecting element 12, and each field focus outputted from the aforementioned focus detecting element 11 After extracting the three original focus from from among each field focus which chooses one focus coordinate group from from among each focus coordinate group, and constitutes this focus coordinate group, as shown in drawing 4 , each of these field focus, One flat surface (flat surface which makes one certain vector a normal) containing three straight lines passing through the lens center of a video camera 5 is assumed.

[0035] And as each projecting point which projected on the aforementioned flat surface and was acquired through each straight line shows these three original focus to drawing 5 , it centers on a photographic subject's 2 axis of rotation. Since two square shapes [2 equilateral 3] which carry out one of the oblique sides in common are made, while the length L1 and L2 of a base becomes equal if angle of rotation of the turntable 3 when acquiring a 2-dimensional each picture is set to theta -- the sum of the interior angle of these two equilateral each 3 square shapes -- pi -- a bird clapper to the following formula -- being realized -- the basic angle of theta+phi/2+phi/2=pi however phi / 2:2 equilateral 3 square shapes -- arrangement of this obtains the following formula

[0036] If the projecting point of fulfilling pi-theta=phi, therefore the conditions 1 shown in the following formula is chosen, the projecting point of the original focus which moves produced by rotation of a turntable 3 can be found out.

[0037] Condition 1:pi-theta=phi L1= -- the distance between the projecting points of the distance L2:2 ** original focus between the projecting points of the angle L1:2 ** original focus which two straight lines which connect L2, however the projecting point of phi:each field focus make -- and The direction of the axis of rotation is detected based on the position of the projecting point of each of these field focus, and the re-projection section 14 is supplied as an axial vector with a relative inclination [as opposed to the lens optical axis of a video camera 5 for this].

[0038] In addition, in this example, although a photographic subject's 2 hand of cut is not inputted at the time of photography, the movement of the projecting point on the flat surface which makes a normal the axial vector searched for by this sequence serves as a hand of cut to the axial vector at the time of photography.

[0039] Processing mentioned above is hereafter performed to each focus coordinate group, the axial vector corresponding to each field focus which constitutes each focus coordinate group is detected, and this is supplied to the re-projection section 14.

[0040] While the <re-projection section 14> re-projection section 14 incorporates each axial vector outputted from the aforementioned axis-of-rotation reference section 13, and each field focus outputted from the aforementioned focus detecting element 11 Based on the information on each field focus, about the focus coordinate group from which three or more focus coordinates were acquired Make into a reference point the point which is in the equal distance from each projecting point on the flat surface which makes an axial vector a normal, and about the focus coordinate group the number of focus coordinates is [group] two It is the equal distance from the projecting point on the flat surface which makes an axial vector a normal, and when you center on the point, let the point of fulfilling the conditions of a hand of cut over the axial vector from the aforementioned axis-of-rotation reference section 13 be a reference point.

[0041] Then, where the direction of a normal is held, so that the reference point called for from each focus coordinate group may serve as the same direction as an axial vector in 3-dimensional space as shown in drawing 6 , and it may stand in a line in the shape of a straight line While moving a projection flat surface, asking for configuration data based on the projecting point of each field focus obtained by this and supplying this to texture geometrical conversion and the average section 15 as the aforementioned photographic subject's 2 3-dimensional configuration information The processor which performs compression of a dynamic image, objective recognition, CG creation, etc. is supplied.

[0042] In addition, the projecting point of each field focus which re-calculated by having carried out flat-surface movement, and was obtained by this to project is made into the aforementioned photographic

subject's 2 3-dimensional configuration information so that the reference point of other focus coordinate groups may approach most the shape of a straight line with equal axial vector and direction which pass along the reference point for which it asked from a certain focus coordinate group in fact.
[0043] Acquisition processing [of <<surface texture information]>>
The aforementioned photographic subject's 2 3-dimensional configuration information that the <texture geometrical conversion and average section 15> texture geometrical conversion and the average section 15 are outputted from the aforementioned re-projection section 14, While incorporating each axial vector outputted from the aforementioned movement detecting element 12, and the 2-dimensional each picture outputted from the aforementioned photography and the angle control section 10 The surface field surrounded by each three focus based on the aforementioned photographic subject's 2 3-dimensional configuration information in 3-dimensional space After detecting angle of rotation which carries out a right pair to the lens optical axis of a video camera 5, carrying out geometrical conversion of other two-dimensional pictures (two-dimensional picture including the aforementioned surface field) corresponding to the pattern and this angle of rotation of a two-dimensional picture of this angle of rotation and searching for a surface pattern, These are equalized and the average pattern of the aforementioned surface field is searched for.
[0044] In addition, when the positions of the focus to surround differ, it equalizes about an overlapping portion and an average pattern is searched for.
[0045] Processing mentioned above is performed also to other surface fields hereafter surrounded by the three focus in a photographic subject's 2 front face, the average pattern of the aforementioned photographic subject's 2 whole front face is searched for, and the processor which performs compression of a dynamic image, objective recognition, CG creation, etc. is supplied by making this into surface texture information.
[0046] Thus, in this example, controlling angle of rotation of the aforementioned stepping motor 4 by the computer 6 The picture for every angle of rotation which photoed the aforementioned photographic subject 2 and was obtained with the video camera 5 (two-dimensional picture), While detecting the movement of the focus in the aforementioned photographic subject's 2 front face based on angle of rotation of the aforementioned stepping motor 4, searching the aforementioned photographic subject's 2 axis of rotation, carrying out based on this axis of rotation and creating the aforementioned photographic subject's 2 3-dimensional configuration information Since surface texture information was created based on this 3-dimensional configuration information and the two-dimensional picture for every aforementioned angle of rotation, the effect described below can be acquired.
[0047] First, 3-dimensional configuration information and surface texture information can be simultaneously acquired by rotating a photographic subject 2 and taking a photograph like the slit light projection which is the conventional technique, without using the special light sources, such as laser slit light.
[0048] Furthermore, extraction failure of the 3-dimensional focus which has a cluster value below a threshold like the 3-dimensional baud DINGU method which is the conventional technique, The precision fall in which obtaining exact camera positional information originates in a difficult thing, Losing un-arranging, such as 3-dimensional focus extraction of the falsehood produced when processing simultaneously to the precision limitation by using the quantized voxel space, and all the focus While being able to extract only the exact 3-dimensional focus, exact surface texture information can be acquired.
[0049] Moreover, although the two-dimensional picture for every angle of rotation outputted from photography and the angle control section 10 is classified every 8 pixels and it is made two or more fields by the focus detecting element 11, how to divide others may divide into each field, and you may make it extract the focus by technique other than square total in the example mentioned above.
[0050]
[Effect of the Invention] As explained above, while a photographic subject's exact 3-dimensional configuration information and surface texture information are acquirable simultaneously, preventing the

bad influence to the photographic subject by using the special light source in claims 1 and 2 according to this invention, an equipment configuration can be simplified very much and the manufacturing cost of equipment can be reduced sharply.

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] Solid object data acquisition equipment characterized by providing the following. The rotation drive made to rotate a photographic subject in predetermined angle. The motion picture camera style by which the rotation drive was carried out with this rotation drive and which photos the aforementioned photographic subject and outputs a two-dimensional picture for every angle of rotation. The 3-dimensional configuration information acquisition processing section which detects the movement of the focus in the aforementioned photographic subject's front face based on the two-dimensional picture for every angle of rotation and angle of rotation of the aforementioned rotation drive which were obtained by this motion picture camera style, searches the aforementioned photographic subject's axis of rotation, and creates the aforementioned photographic subject's 3-dimensional configuration information based on this axis of rotation and the aforementioned focus. The surface texture information acquisition processing section which creates surface texture information based on the 3-dimensional configuration information of the aforementioned photographic subject obtained by this 3-dimensional configuration information acquisition processing section, and the two-dimensional picture for every angle of rotation obtained by the aforementioned motion picture camera style.
[Claim 2] In solid object data acquisition equipment according to claim 1, while the aforementioned 3-dimensional configuration information acquisition processing section extracts the focus from the two-dimensional picture for every angle of rotation After detecting the movement of each of these focus and detecting the axis of rotation corresponding to each focus, Arrange each of these axes of rotation in the shape of a straight line, determine the position on the 3-dimensional space of each aforementioned focus, and a photographic subject's 3-dimensional configuration information is created. Moreover, the aforementioned surface texture information acquisition processing section is based on the aforementioned photographic subject's 3-dimensional configuration information. Solid object data acquisition equipment characterized by what angle of rotation in which the surface field surrounded by each focus carries out a right pair to the aforementioned motion picture camera style is detected, and surface texture information is created for based on the pattern of the two-dimensional picture of this angle of rotation.

[Translation done.]

* NOTICES *

TECHNICAL FIELD

[Industrial Application] This inventions are only the two-dimensional picture photoed under general photography conditions, and the angle information at the time of photography, and relate to the exact 3-dimensional configuration information on the solid object used as material information, such as compression of a dynamic image, objective recognition, and the CG creation, exact surface texture (Surface Texture) information, and the obtained solid object data acquisition equipment.
[0002] It is a thing about the equipment which acquires the 3-dimensional configuration information on a solid object, and the surface texture information corresponding to it from the photography image which is a two-dimensional picture in a [outline of invention] this invention, without using special lighting, a special sensor, etc. of **** of measurement assistance. While extracting a photographic subject's focus from the two-dimensional image photoed and obtained with a video camera etc., carrying the target photographic subject on a rotation base, and rotating this Based on the movement information on each of these focus, iterative operation of the relative inclination of the axis of rotation to the lens optical axis of a video camera is carried out. Therefore, the axis-of-rotation information that the precision which considered correspondence with the 3-dimensional space where a photographic subject exists, and the camera image pck-up side which is two-dimensional as central projection, and was acquired by iterative operation is high, Using known angle-of-rotation information, compared with the conventional technique of needing the light sources, exact camera positional information, etc., such as laser slit light, it is easy composition and the 3-dimensional configuration information on a solid object and the surface texture information corresponding to it are acquired.

[Translation done.]

* NOTICES *

PRIOR ART

[Description of the Prior Art] There is the passive measurement technique using the special light sources, such as laser slit light, the special active measurement technique to be used, such as sensor etc., and photography images, such as a video camera, as the 3-dimensional configuration information on the solid object used as material information, such as compression of a dynamic image, objective recognition, and the CG creation, surface texture information, and technique to acquire conventionally.
[0004] As a former example, there is slit light projection, and by this slit light projection, as it states below, the 3-dimensional configuration information on a solid object is acquired.
[0005] First, as shown in drawing 7 , while establishing a base 103 in the position which only predetermined distance left from the base 102 on which the photographic subject 101 was put and arranging a laser light source 104 on this base 103, the cylindrical lens 105 which changes into the slit light (laser slit light) S the laser beam by which outgoing radiation is carried out from this laser light source 104 is arranged, and a camera 106 is arranged in the position which only predetermined distance left from the base 102 on which the aforementioned photographic subject 101 is put further.
[0006] And where a photographic subject 101 is carried on a base 102, while carrying out outgoing radiation of the laser beam from a laser light source 104, changing this laser beam into the slit light (laser slit light) S with a cylindrical lens 105 and irradiating the aforementioned photographic subject 101, the aforementioned photographic subject 101 is photoed with a camera 106, and the slit picture of the photographic subject 101 corresponding to the laser slit light S is made to be caught on the image pck-up side 107 of this camera 106.
[0007] The 3-dimensional space coordinates of the point P on the flat surface which the laser slit light S makes by this among the 3-dimensional space coordinates which show the shape of a photographic subject's 101 surface type This point P It is projected on certain one point P' on the image pck-up side 107 through the straight line L passing through the lens center O of a camera 106, and the visible outline (slit picture) of the cross section cut off at the flat surface which the aforementioned laser slit light S makes among the shape of the aforementioned photographic subject's 101 surface type on the image pck-up side 107 is projected.
[0008] Moving horizontally the direction of laser outgoing radiation of a laser light source 104 little by little, photography which mentioned above is performed and the visible outline of the cross section cut off at each flat surface which each aforementioned laser slit light S makes among the shape of a photographic subject's 101 surface type on each image pck-up side 107 is made to project hereafter.
[0009] And each visible outline on each slit picture obtained when the photography processing mentioned above was completed is supplied to the processor which performs compression of a dynamic image, objective recognition, CG creation, etc. as the aforementioned photographic subject's 101 3-dimensional information, and each aforementioned visible outline is made to process about the photographic subject 101 whole.
[0010] Moreover, as a latter example, there is the 3-dimensional baud DINGU method, and by this 3-dimensional baud DINGU method, as it states below, the 3-dimensional configuration information on a solid object is acquired.

[0011] First, as a photographic subject is photoed from two or more views with a camera and it is shown in drawing 8 , the point (two-dimensional focus) which serves as the aforementioned photographic subject's feature from each picture acquired by this is extracted, and it asks for the visual axis passing through these 2-dimensional each focus and lens centers of a camera.
[0012] Subsequently, by dividing into a 3-dimensional pixel (this being hereafter called the voxel) the space where a photographic subject exists, adding the constant value defined beforehand to each voxel along which each visual axis passes, and calculating the cluster value for every voxel The voxel which each visual axis intersects mostly is extracted as a photographic subject's 3-dimensional focus. these 3-dimensional each focus as the aforementioned photographic subject's 3-dimensional information The processor which performs compression of a dynamic image, objective recognition, CG creation, etc. is supplied, and the aforementioned 3-dimensional each focus is made to process.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, while a photographic subject's exact 3-dimensional configuration information and surface texture information are acquirable simultaneously, preventing the bad influence to the photographic subject by using the special light source in claims 1 and 2 according to this invention, an equipment configuration can be simplified very much and the manufacturing cost of equipment can be reduced sharply.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, there was a problem which is described below in the slit light projection and the 3-dimensional baud DINGU method which were mentioned above.
[0014] First, in the slit light projection shown in drawing 7 , in order to raise measurement precision Since a laser light source 104 is used and width of face of the laser slit light S is narrowed as the light source When a photographic subject 101 is the work of art which is made of paper etc., while it dries the front face of a work of art with the heat of the laser slit light S or there is a possibility of making it discoloring Since only a photographic subject's 101 3-dimensional configuration information could be acquired, a photographic subject's front face was photoed separately and there was a problem that a photographic subject's 101 surface texture information had to be acquired.
[0015] moreover, by the 3-dimensional baud DINGU method shown in drawing 8 When two or more 3-dimensional focus is extracted simultaneously, the processing to the 3-dimensional each focus interferes each other, and the false 3-dimensional focus occurs. moreover, by the quantization error of a picture etc. While being unable to extract the focus which became below the threshold with the added cluster value as the 3-dimensional focus, there was a problem that the precision of a configuration will be decided by the set-up voxel space quantization degree.
[0016] Furthermore, theoretically, although the information on an exact camera position is needed, it has not been the technique which it was difficult to extract the exact 3-dimensional focus, and it still established technically at present from it being very difficult to ask for the center position of a camera lens correctly.
[0017] While a photographic subject's exact 3-dimensional configuration information and surface texture information are acquirable simultaneously, preventing the bad influence to the photographic subject by this invention using the special light source in view of the above-mentioned situation, an equipment configuration is simplified very much and it aims at offering the solid object data acquisition equipment which can reduce the manufacturing cost of equipment sharply.

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] this invention is characterized by providing the following to solid object data acquisition equipment, in order to attain the above-mentioned purpose. The rotation drive made to rotate a photographic subject in predetermined angle in a claim 1. The motion picture camera style by which the rotation drive was carried out with this rotation drive and which photos the aforementioned photographic subject and outputs a two-dimensional picture for every angle of rotation. The 3-dimensional configuration information acquisition processing section which detects the movement of the focus in the aforementioned photographic subject's front face based on the two-dimensional picture for every angle of rotation and angle of rotation of the aforementioned rotation drive which were obtained by this motion picture camera style, searches the aforementioned photographic subject's axis of rotation, and creates the aforementioned photographic subject's 3-dimensional configuration information based on this axis of rotation and the aforementioned focus. The surface texture information acquisition processing section which creates surface texture information based on the 3-dimensional configuration information of the aforementioned photographic subject obtained by this 3-dimensional configuration information acquisition processing section, and the two-dimensional picture for every angle of rotation obtained by the aforementioned motion picture camera style.
[0019] Moreover, in a claim 2, in solid object data acquisition equipment according to claim 1, while the aforementioned 3-dimensional configuration information acquisition processing section extracts the focus from the two-dimensional picture for every angle of rotation After detecting the movement of each of these focus and detecting the axis of rotation corresponding to each focus, Arrange each of these axes of rotation in the shape of a straight line, determine the position on the 3-dimensional space of each aforementioned focus, and a photographic subject's 3-dimensional configuration information is created. Moreover, the aforementioned surface texture information acquisition processing section is based on the aforementioned photographic subject's 3-dimensional configuration information. To the aforementioned motion picture camera style, the surface field surrounded by each focus detects angle of rotation which carries out a right pair, and is characterized by creating surface texture information based on the pattern of the two-dimensional picture of this angle of rotation.

[Translation done.]

* NOTICES *

OPERATION

[Function] It sets in the above-mentioned composition and is with the solid object data acquisition equipment of a claim 1. While photoing the aforementioned photographic subject and generating a two-dimensional picture for every angle of rotation by the motion picture camera style, rotating a photographic subject in predetermined angle with a rotation drive The 3-dimensional configuration information acquisition processing section detects the movement of the focus in the aforementioned photographic subject's front face based on the two-dimensional picture for every aforementioned angle of rotation, and angle of rotation of the aforementioned rotation drive. After searching the aforementioned photographic subject's axis of rotation, it is based on this axis of rotation and the aforementioned focus. Create the aforementioned photographic subject's 3-dimensional configuration information, and it is based on the 3-dimensional configuration information of the aforementioned photographic subject further obtained by the surface texture information acquisition processing section in the aforementioned 3-dimensional configuration information acquisition processing section, and the two-dimensional picture for every angle of rotation obtained at aforementioned motion picture camera guard. While acquiring simultaneously a photographic subject's exact 3-dimensional configuration information and surface texture information, preventing the bad influence to the photographic subject by using the special light source by creating surface texture information An equipment configuration is simplified very much and the manufacturing cost of equipment is reduced sharply.
[0021] Moreover, it is while the aforementioned 3-dimensional configuration information acquisition processing section extracts the focus from the two-dimensional picture for every angle of rotation in solid object data acquisition equipment according to claim 1 in a claim 2. After detecting the movement of each of these focus and detecting the axis of rotation corresponding to each focus, Each of these axes of rotation are arranged in the shape of a straight line, the position on the 3-dimensional space of each aforementioned focus is determined, and a photographic subject's 3-dimensional configuration information is created. in moreover, the aforementioned surface texture information acquisition processing section When the surface field surrounded by each focus detects angle of rotation which carries out a right pair to the aforementioned motion picture camera style and creates surface texture information based on the pattern of the two-dimensional picture of this angle of rotation based on the aforementioned photographic subject's 3-dimensional configuration information While acquiring simultaneously a photographic subject's exact 3-dimensional configuration information and surface texture information, preventing the bad influence to the photographic subject by using the special light source like a claim 1, an equipment configuration is simplified very much and the manufacturing cost of equipment is reduced sharply.

[Translation done.]

* NOTICES *

EXAMPLE

[Example] Drawing 1 is the block diagram showing one example of the solid object data acquisition equipment by this invention.
[0023] The turntable 3 on which, as for the solid object data acquisition equipment 1 shown in this drawing, a photographic subject 2 is put, This turntable 3 Every [a fixed angle] and the stepping motor 4 to rotate, It is arranged in the position which only predetermined distance separated from the aforementioned photographic subject 2, and the video camera 5 which photos the aforementioned photographic subject 2, and the image obtained with the aforementioned video camera 5 while controlling operation of the aforementioned stepping motor 4 are incorporated. It has the computer 6 which searches for simultaneously the aforementioned photographic subject's 2 exact 3-dimensional configuration information and surface texture information.
[0024] And, controlling angle of rotation of the aforementioned stepping motor 4 by the computer 6 The picture for every angle of rotation which photoed the aforementioned photographic subject 2 and was obtained with the video camera 5 (two-dimensional picture), While detecting the movement of the focus in the aforementioned photographic subject's 2 front face based on angle of rotation of the aforementioned stepping motor 4, searching the aforementioned photographic subject's 2 axis of rotation, carrying out based on the information on this axis of rotation and creating the aforementioned photographic subject's 2 3-dimensional configuration information Based on this 3-dimensional configuration information and the two-dimensional picture for every aforementioned angle of rotation, surface texture information is created and these 3-dimensional configuration information and surface texture information are supplied to the processor which performs compression of a dynamic image, objective recognition, CG creation, etc.
[0025] Next, processing of the computer 6 shown in drawing 1 is explained in detail, referring to the block diagram shown in drawing 2 .
[0026] As shown in drawing 2 , a computer 6 First, photography and the angle control section 10, The focus detecting element 11, the movement detecting element 12, the axis-of-rotation reference section 13, and the re-projection section 14, The function has separated in texture geometrical conversion and the average section 15, and photography and the angle control section 10 perform picture acquisition processing for every angle of rotation. Moreover, the focus detecting element 11, The movement detecting element 12, the axis-of-rotation reference section 13, and the re-projection section 14 perform acquisition processing of 3-dimensional configuration information, and texture geometrical conversion and the average section 15 perform acquisition processing of surface texture information further.
[0027] Picture acquisition processing [for <<each angle of rotation of every]>>
The <photography and angle control-section 10> photography and the angle control sections 10 are angle-of-rotation units, such as 1 step unit or a half step unit. While rotating the turntable 3 on which the rotation drive of the stepping motor 4 was carried out, and the photographic subject 2 was put It holds as a pixel which is made to photo a photographic subject 2 with a video camera 5, incorporates a photographic subject's 2 picture (two-dimensional picture) for every angle of rotation, makes lengthwise [of a photographic subject 2] a line for this as shown in drawing 3 , and makes a train the aforementioned

photographic subject's 2 longitudinal direction and by which two-dimensional array was carried out. In addition, the data (pixel data) of the pixel arranged on two-dimensional have a big numeric value, so that they are bright.

[0028] And the two-dimensional picture for every angle of rotation which is made to act as the one revolution of the aforementioned photographic subjects 2, and is obtained is supplied to the focus detecting element 11, the movement detecting element 12, and texture geometrical conversion and the average section 15.

[0029] Acquisition processing [of 3 <<-dimensional configuration information]>>

While the <focus detecting-element 11> focus detecting element 11 incorporates the two-dimensional picture for every angle of rotation outputted from the aforementioned photography and the angle control section 10 After dividing 8 pixels of each pixel of this two-dimensional picture at a time in a line writing direction and the direction of a train and dividing into two or more fields, Square total of the profile intensity which asks for the profile intensity of each image data, and is contained to each of these fields The central point of all the fields that have become more than the threshold set up beforehand is extracted as the focus of this two-dimensional picture, it moves as the original focus and each of these focus is supplied to a detecting element 12, the axis-of-rotation reference section 12, and the re-projection section 14.

[0030] While the <movement detecting-element 12> movement detecting element 12 incorporates the original focus for every angle of rotation outputted from the aforementioned focus detecting element 11, and the two-dimensional picture for every angle of rotation outputted from the aforementioned photography and the angle control section 10 Based on the original focus on one two-dimensional picture, the portion of the content closely resembled most within other two-dimensional pictures which should ask for correspondence is extracted. When block matching of the technique of making this portion the focus coordinate in a 2-dimensional each picture is performed and each focus of a photographic subject 2 rotates, it asks for how it moved as a coordinate value on the image pck-up side of a video camera 5.

[0031] In addition, the field which is in other two-dimensional pictures which should ask for correspondence in fact based on the original focus on one two-dimensional picture is chosen, processing which searches for the difference of the pixel brightness of the same coordinates in this field is performed about all the pixels in a field, and square total (evaluation value) of each pixel obtained by this makes the portion used as the minimum the focus corresponding to the aforementioned field focus.

[0032] And block matching with the two-dimensional picture of a further different angle is performed to such a coordinate of the corresponding original focus, the original focus which correspond among each field focus of a 2-dimensional each picture is summarized, and the axis-of-rotation reference section 13, and texture geometrical conversion and the average section 15 are supplied by making the coordinate (coordinate on a 2-dimensional each picture) of each of these field focus into a focus coordinate group.

[0033] however, since the original focus which corresponds depending on a two-dimensional picture may not exist, when it is below a threshold with an evaluation value Only when processing judged that the corresponding original focus does not exist is performed and the three or more original focus corresponds on the two-dimensional picture photoed by the angle of rotation, the axis-of-rotation reference section 13, and texture geometrical conversion and the average section 15 are supplied by making these original focus into a focus coordinate group.

[0034] While the <axis-of-rotation reference section 13> axis-of-rotation reference section 13 incorporates each focus coordinate group outputted from the aforementioned movement detecting element 12, and each field focus outputted from the aforementioned focus detecting element 11 After extracting the three original focus from from among each field focus which chooses one focus coordinate group from from among each focus coordinate group, and constitutes this focus coordinate group, as shown in drawing 4 , each of these field focus, One flat surface (flat surface which makes one certain vector a normal) containing three straight lines passing through the lens center of a video camera 5 is assumed.

[0035] And as each projecting point which projected on the aforementioned flat surface and was acquired through each straight line shows these three original focus to drawing 5 , it centers on a photographic subject's 2 axis of rotation. Since two square shapes [2 equilateral 3] which carry out one of the oblique sides in common are made, while the length L1 and L2 of a base becomes equal if angle of rotation of the turntable 3 when acquiring a 2-dimensional each picture is set to theta -- the sum of the interior angle of these two equilateral each 3 square shapes -- pi -- a bird clapper to the following formula -- being realized -- the basic angle of theta+phi/2+phi/2=pi however phi / 2:2 equilateral 3 square shapes -- arrangement of this obtains the following formula

[0036] If the projecting point of fulfilling pi-theta=phi, therefore the conditions 1 shown in the following formula is chosen, the projecting point of the original focus which moves produced by rotation of a turntable 3 can be found out.

[0037] Condition 1:pi-theta=phi L1= -- the distance between the projecting points of the distance L2:2 ** original focus between the projecting points of the angle L1:2 ** original focus which two straight lines which connect L2, however the projecting point of phi:each field focus make -- and The direction of the axis of rotation is detected based on the position of the projecting point of each of these field focus, and the re-projection section 14 is supplied as an axial vector with a relative inclination [as opposed to the lens optical axis of a video camera 5 for this].

[0038] In addition, in this example, although a photographic subject's 2 hand of cut is not inputted at the time of photography, the movement of the projecting point on the flat surface which makes a normal the axial vector searched for by this sequence serves as a hand of cut to the axial vector at the time of photography.

[0039] Processing mentioned above is hereafter performed to each focus coordinate group, the axial vector corresponding to each field focus which constitutes each focus coordinate group is detected, and this is supplied to the re-projection section 14.

[0040] While the <re-projection section 14> re-projection section 14 incorporates each axial vector outputted from the aforementioned axis-of-rotation reference section 13, and each field focus outputted from the aforementioned focus detecting element 11 Based on the information on each field focus, about the focus coordinate group from which three or more focus coordinates were acquired Make into a reference point the point which is in the equal distance from each projecting point on the flat surface which makes an axial vector a normal, and about the focus coordinate group the number of focus coordinates is [group] two It is the equal distance from the projecting point on the flat surface which makes an axial vector a normal, and when you center on the point, let the point of fulfilling the conditions of a hand of cut over the axial vector from the aforementioned axis-of-rotation reference section 13 be a reference point.

[0041] Then, where the direction of a normal is held, so that the reference point called for from each focus coordinate group may serve as the same direction as an axial vector in 3-dimensional space as shown in drawing 6 , and it may stand in a line in the shape of a straight line While moving a projection flat surface, asking for configuration data based on the projecting point of each field focus obtained by this and supplying this to texture geometrical conversion and the average section 15 as the aforementioned photographic subject's 2 3-dimensional configuration information The processor which performs compression of a dynamic image, objective recognition, CG creation, etc. is supplied.

[0042] In addition, the projecting point of each field focus which re-calculated by having carried out flat-surface movement, and was obtained by this to project is made into the aforementioned photographic subject's 2 3-dimensional configuration information so that the reference point of other focus coordinate groups may approach most the shape of a straight line with equal axial vector and direction which pass along the reference point for which it asked from a certain focus coordinate group in fact.

[0043] Acquisition processing [of <<surface texture information]>>

The aforementioned photographic subject's 2 3-dimensional configuration information that the <texture geometrical conversion and average section 15> texture geometrical conversion and the average section 15 are outputted from the aforementioned re-projection section 14, While incorporating each axial vector

outputted from the aforementioned movement detecting element 12, and the 2-dimensional each picture outputted from the aforementioned photography and the angle control section 10 The surface field surrounded by each three focus based on the aforementioned photographic subject's 2 3-dimensional configuration information in 3-dimensional space After detecting angle of rotation which carries out a right pair to the lens optical axis of a video camera 5, carrying out geometrical conversion of other two-dimensional pictures (two-dimensional picture including the aforementioned surface field) corresponding to the pattern and this angle of rotation of a two-dimensional picture of this angle of rotation and searching for a surface pattern, These are equalized and the average pattern of the aforementioned surface field is searched for.

[0044] In addition, when the positions of the focus to surround differ, it equalizes about an overlapping portion and an average pattern is searched for.

[0045] Processing mentioned above is performed also to other surface fields hereafter surrounded by the three focus in a photographic subject's 2 front face, the average pattern of the aforementioned photographic subject's 2 whole front face is searched for, and the processor which performs compression of a dynamic image, objective recognition, CG creation, etc. is supplied by making this into surface texture information.

[0046] Thus, in this example, controlling angle of rotation of the aforementioned stepping motor 4 by the computer 6 The picture for every angle of rotation which photoed the aforementioned photographic subject 2 and was obtained with the video camera 5 (two-dimensional picture), While detecting the movement of the focus in the aforementioned photographic subject's 2 front face based on angle of rotation of the aforementioned stepping motor 4, searching the aforementioned photographic subject's 2 axis of rotation, carrying out based on this axis of rotation and creating the aforementioned photographic subject's 2 3-dimensional configuration information Since surface texture information was created based on this 3-dimensional configuration information and the two-dimensional picture for every aforementioned angle of rotation, the effect described below can be acquired.

[0047] First, 3-dimensional configuration information and surface texture information can be simultaneously acquired by rotating a photographic subject 2 and taking a photograph like the slit light projection which is the conventional technique, without using the special light sources, such as laser slit light.

[0048] Furthermore, extraction failure of the 3-dimensional focus which has a cluster value below a threshold like the 3-dimensional baud DINGU method which is the conventional technique, The precision fall in which obtaining exact camera positional information originates in a difficult thing, Losing un-arranging, such as 3-dimensional focus extraction of the falsehood produced when processing simultaneously to the precision limitation by using the quantized voxel space, and all the focus While being able to extract only the exact 3-dimensional focus, exact surface texture information can be acquired.

[0049] Moreover, although the two-dimensional picture for every angle of rotation outputted from photography and the angle control section 10 is classified every 8 pixels and it is made two or more fields by the focus detecting element 11, how to divide others may divide into each field, and you may make it extract the focus by technique other than square total in the example mentioned above.

[0050]

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

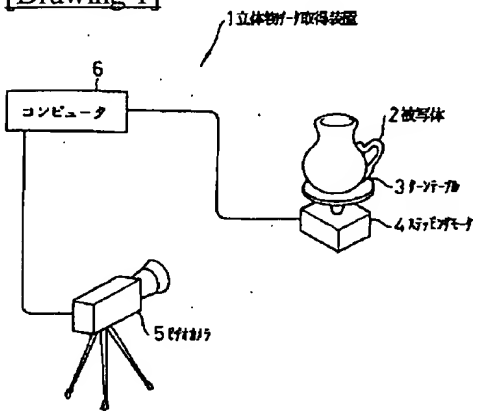
[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing one example of the solid object data acquisition equipment by this invention.
[Drawing 2] It is the block diagram showing the example of functional composition of the computer shown in drawing 1 .
[Drawing 3] It is the ** type view showing the example of a format of the two-dimensional picture outputted from the photography and the angle control section which are shown in drawing 1 .
[Drawing 4] It is the ** type view showing the example of axis-of-rotation reference processing of the axis-of-rotation reference section shown in drawing 1 .
[Drawing 5] It is the ** type view showing the example of axis-of-rotation reference processing of the axis-of-rotation reference section shown in drawing 1 .
[Drawing 6] It is the ** type view showing the example of re-projection processing of the re-projection section shown in drawing 1 .
[Drawing 7] It is a block diagram for explaining slit light projection among the active measurement technique known from the former as the technique of acquiring the 3-dimensional configuration information on a solid object.
[Drawing 8] It is a block diagram for explaining the 3-dimensional baud DINGU method among the passive measurement technique known from the former as the technique of acquiring the 3-dimensional configuration information on a solid object.
[Description of Notations]
1 Solid Object Data Acquisition Equipment
2 Photographic Subject
3 Turntable (Rotation Drive)
4 Stepping Motor (Rotation Drive)
5 Video Camera (Motion Picture Camera Style)
6 Computer
10 Photography and Angle Control Section (Rotation Drive, Motion Picture Camera Style)
11 Focus Detecting Element (3-dimensional Configuration Information Acquisition Processing Section)
12 Movement Detecting Element (3-dimensional Configuration Information Acquisition Processing Section)
13 Axis-of-Rotation Reference Section (3-dimensional Configuration Information Acquisition Processing Section)
14 Re-Projection Section (3-dimensional Configuration Information Acquisition Processing Section)
15 Texture Geometrical Conversion and Average Section (Surface Texture Information Acquisition Processing Section)

[Translation done.]

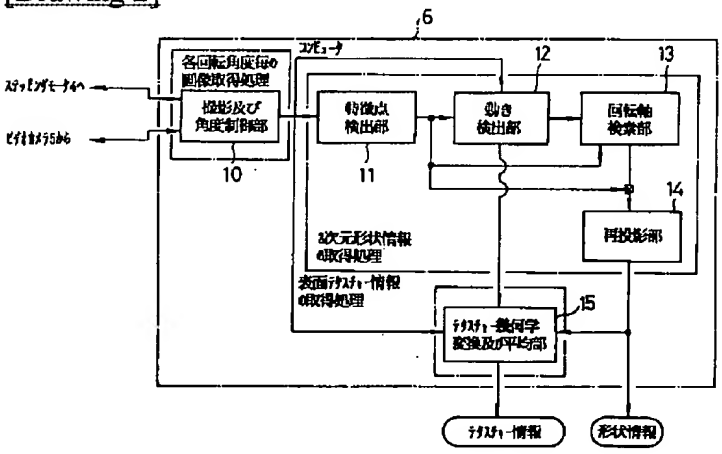
* NOTICES *

DRAWINGS

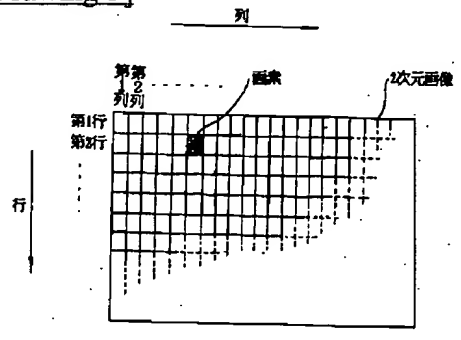
[Drawing 1]



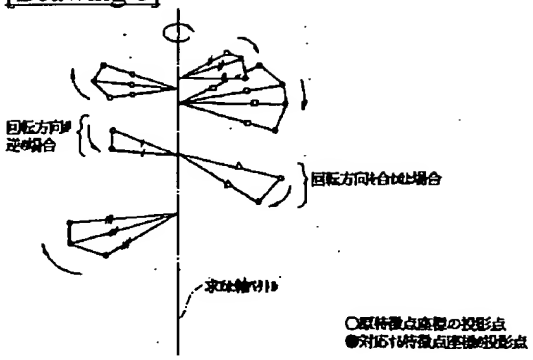
[Drawing 2]



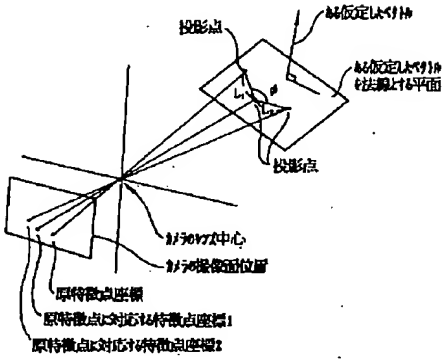
[Drawing 3]



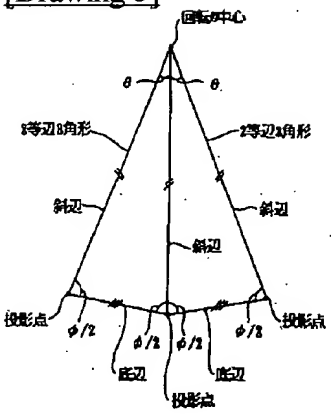
[Drawing 6]



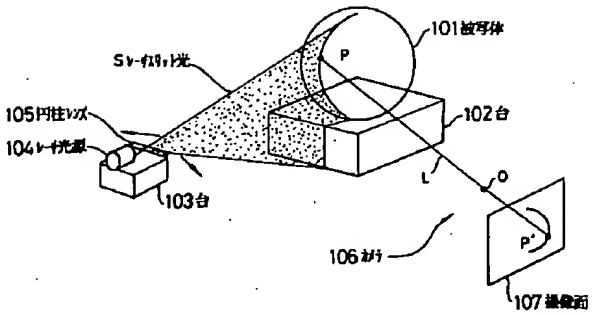
[Drawing 4]



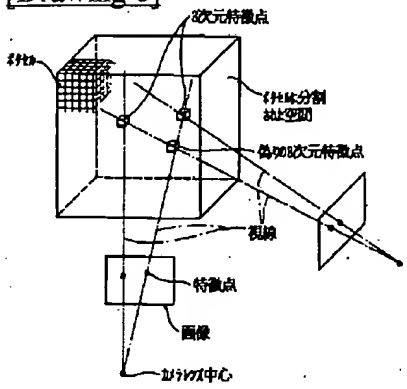
[Drawing 5]



[Drawing 7]



[Drawing 8]



[Translation done.]